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Non-genetic Risk Factors for Atrial Fibrillation in Individuals Aged 60 and Above

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Abstract **Introduction:** Atrial fibrillation (AF) is the most common heart rhythm disorder and is associated with several potentially life-threatening complications. Its global prevalence is rising, particularly among aging populations. In Saudi Arabia, data regarding the prevalence of AF remains limited. Various risk factors, including advanced age, metabolic syndrome and lifestyle habits, contribute to the increasing incidence of AF. **Objective:** This study aims to identify the most significant modifiable risk factors associated with the incidence of AF in individuals aged 60 years and older at the time of initial diagnosis, with the goal of reducing related complications and overall morbidity. **Methods:** This is a retrospective study that examined the specific risk factors associated with AF in older individuals at a tertiary hospital. All patients aged ≥ 60 years who were newly diagnosed with AF were included. **Results:** This study included 211 consecutive patients at a large tertiary hospital in Jeddah, Saudi Arabia. The mean age at diagnosis was 74±9 years. Overweight individuals with a BMI of 25–29.9 kg/m² accounted for 30.8% of the sample. Additionally, 29.3% had hypertension and 23.4% had diabetes. Regarding cardiac comorbidities, 34.3% had ischemic heart disease and 34.9% had heart failure. Non-cardiac conditions included pneumonia 12.9% and a history of pulmonary embolism 3.8%. **Conclusion:** Our research emphasizes the critical role of modifiable factors such as elevated BMI in influencing the risk of AF and highlights the most common comorbidities requiring targeted interventions, particularly the management of hypertension and diabetes, to reduce the burden of AF in the older adult population.

Key Words Atrial Fibrillation, Risk Factors, Comorbidities, Complications

INTRODUCTION

Atrial fibrillation (AF) is the most common heart rhythm disorder in adults, which significantly impacts cardiovascular health, resulting in a diminished functional status and health-related quality of life[1]. A dynamic age period cohort progression model was used in a study conducted in the United States to project the growth rate in AF incidence and prevalence[2]. It included all diagnosed instances of AF in future prevalence estimates, regardless of follow-up therapy, as well as cases considered to be chronic[2]. According to the model, the incidence of AF will double by 2030, from 1.2 million cases in 2010 to 2.6 million cases[2]. The prevalence of AF is expected to rise from 5.2 million cases in 2010 to 12.1 million cases in 2030 [2]. If subclinical or "silent" AF is included, the true prevalence of AF would be higher [3]. In Saudi Arabia, data regarding the prevalence of AF remains unclear [4].

The risk of AF is highly prevalent, particularly in people aged ≥65 years [5]. Although it is usually observed in older individuals, it can also be identified in younger patients and subgroups with no comorbidities [6]. Age is a significant and well-established risk factor; however, it is not the only factor [7]. Arrhythmia is associated with considerable heterogeneity in age and comorbidities [7]. AF is closely correlated with metabolic syndrome and some of its variable components, including abdominal obesity, hypertension and impaired glucose tolerance/type 2 diabetes [8–10].

Furthermore, compared to the past, the number of people with AF may have increased owing to advancements in cardiovascular disease therapy and patient survival [11–13].

In a study using the Korean National Health Insurance Service (K-NHIS)-National Sample Cohort (NHIS-NSC), a single medical insurer in the Republic of Korea managed by the government, the screening period was from January 2002 to December 2008. The follow-up period ranged from the national health checkup date to the date of new-onset AF incidence or December 2017. In this study, several large

registries demonstrated an association between AF and body mass index (BMI). Additionally, people who currently smoked and were aged 30–70 years were more likely to have new-onset AF [14].

Another study conducted in Korea on 14,540 persons (6,573 men) under the age of 40 years who underwent general health screenings between April 2000 and December 2000, all participants completed questionnaires regarding their history of medical conditions, smoking and alcohol use and underwent physical examinations, which included blood pressure measurement, electrocardiography, total cholesterol measurement and fasting blood sugar testing. The results revealed that the most significant risk factor for AF was heart failure, which increased the risk by 5.9 times for women and 4.5 times for men. Myocardial infarction was substantially correlated with AF only in men, accounting for an increased risk of 40%. Age, cigarette smoking, diabetes, hypertension and electrocardiogram (ECG)-left ventricular hypertrophy (LVH) were significant predictors of AF in both genders [15].

To the best of our knowledge, there is insufficient research on other risk factors associated with age in older patients with AF in Saudi Arabia. This study aimed to identify the risk factors associated with AF in older individuals at a tertiary hospital.

METHODS

This retrospective observational study was approved by the Institutional Review Board (IRB) at King Abdulaziz University Hospital (KAUH), a tertiary hospital in Jeddah, Saudi Arabia (Reference Number: 267-23). The study complied with the ethical standards of the Declaration of Helsinki. Patient confidentiality was maintained throughout the study by anonymizing all personal identifiers during data collection and analysis.

Patients enrolled between June 2016 and April 2023 were screened. Consecutive patients aged ≥ 60 years who were newly diagnosed with AF were included. AF diagnosis was confirmed using ECG and cardiac implantable electronic devices (CIED) and cases were identified via the International Classification of Diseases, 10th Revision (ICD-10) code I48. Exclusion criteria included patients with previous AF diagnoses, those with missing ECG/CIED confirmation or incomplete demographic or clinical records. The final study sample comprised 211 patients. The sample size was based on available data over the study period. The sample size was considered adequate for exploratory analysis based on data availability and clinical representativeness over a 7-year period.

Data were extracted from the hospital's electronic medical record system. Collected variables included sociodemographic characteristics, comorbidities and history of cardiac and non-cardiac diseases. Comorbidities were identified and classified based on physician documented diagnoses in the medical records, using standard terminology consistent with the International Classification of Diseases, 10th Revision (ICD-10). Where applicable, ICD-10 codes were used to ensure consistency across patient records. To ensure data quality, a double-entry system was used for validation and a random 10% sample was re-checked by a second reviewer to ensure consistency and accuracy.

Statistical Analysis

Descriptive statistics were used for the analysis. Simple frequencies and percentages of the categorical variables were calculated and tabulated. Quantitative variables are expressed as means and standard deviations. All statistical analyses were performed using IBM SPSS Statistics (IBM) version 27.0.1.

RESULTS

Sociodemographic Data

Presents the sociodemographic data of the participants. The mean current age was 78±9 years, whereas the mean age at diagnosis was 74±9 years. The sex distribution revealed that 42.7% of the participants were men. In terms of nationality, 46.4% were Saudis and 53.6% were non-Saudis. The BMI categories showed that 2.4% were underweight; 24.2%, normal; 30.8%, overweight; 24.2%, class 1 obese; 12.3%, class 2 obese; and 6.2%, class 3 obese. Regarding smoking history, 1.9% were current smokers; 6.2%, ex-smokers; and 91.9%, non-smokers (Table 1).

Types of Comorbidities

Presents the distribution of comorbidities among study participants. The table shows the frequencies and percentages

Table 1: Sociodemographic Data

Variables	Mean±Standard Deviation	
Current Age	78±9	
Age at Diagnosis	74±9	
Gender	Frequency	Percentage
Male	90	42.7
Nationality		
Saudi	98	46.4
Non-Saudi	113	53.6
Body Mass Index BMI		
<18.5	5	2.4
18.5 - 24.9	51	24.2
25 - 29.9	65	30.8
30 - 34.9	51	24.2
35 - 39.9	26	12.3
>40	13	6.2
Smoking history		
Smoker	4	1.9
Ex-Smoker	13	6.2
Non-Smoker	194	91.9

Table 2: Types of Comorbidities

Variable	Frequency	Percentage
DM	132	23.4
Hypertension	165	29.3
Hypothyroidism	21	3.7
Hyperthyroidism	0	0.0
Chronic kidney disease	37	6.6
Acute kidney disease	31	5.5
COPD	10	1.8
Asthma	20	3.6
Stroke	51	9.1
Sleep apnea	13	2.3
Cancer	23	4.1
Dyslipidemia	34	6.0
Anemia	26	4.6

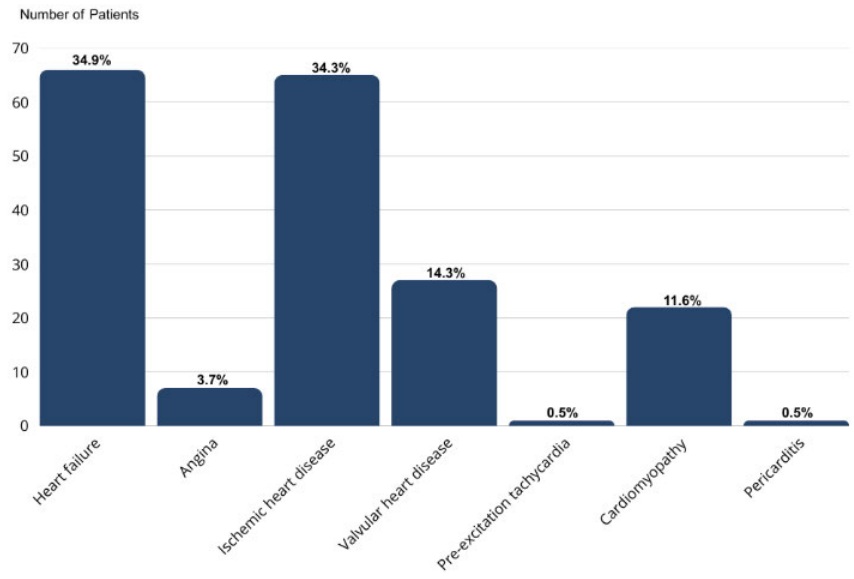

Figure 1: History of Cardiac Disease

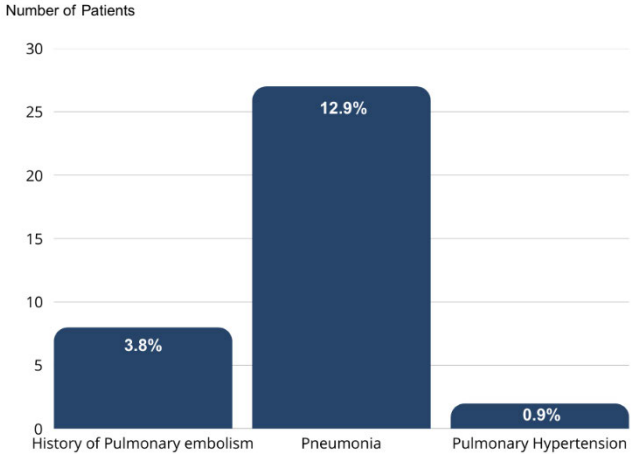

Figure 2: History of Non-Cardiac Disease

of the participants with and without comorbidities. The most prevalent comorbidity was hypertension 29.3%, followed by diabetes mellitus (DM) 23.4%. Other common comorbidities included stroke 9.1 %, chronic kidney disease (CKD) 6.6%, acute kidney disease 5.5% and anemia 4.6%. Asthma 3.6%, sleep apnea 2.3%, dyslipidemia 6% and chronic obstructive pulmonary disease (COPD) 1.8% showed lower prevalence rates. The prevalence rates of hypothyroidism, hyperthyroidism and cancer varied (Table 2).

History of Cardiac Disease

Presents the history of cardiac disease among the study participants, indicating the frequency and percentage of individuals with and without each cardiac condition. The most prevalent cardiac condition was heart failure 34.9%, followed by ischemic heart disease 34.3%. Other common cardiac conditions were valvular heart disease 14.3%, cardiomyopathy 11.6% and angina 3.7%. Specific conditions such as pre-excitation tachycardia and pericarditis had lower prevalence rates (Figure 1).

History of Non-Cardiac Disease

Outlines the history of non-cardiac diseases among the study participants, presenting the frequency and corresponding percentage of individuals with and without each non-cardiac condition. The diseases included pneumonia 12.9%, history of pulmonary embolism 3.8% and pulmonary hypertension 0.9% (Figure 2).

DISCUSSION

The study participants demonstrated a range of sociodemographic characteristics that help frame the overall clinical profile of the population. The average age was 78 years, with a wide age range and the average age at diagnosis was 74 years, highlighting the relevance of age, but also the need to look beyond it when assessing AF risk. The sex distribution was relatively balanced, with 42.7% of participants being male. In terms of nationality, 46.4% were Saudi, which could reflect cultural or healthcare access differences. Regarding BMI, the largest group fell into the overweight category, 30.8%, followed by normal weight, 24.2%. Smaller percentages were either underweighted 2.4% or obese 6.2%, suggesting overall diversity in body composition. Additionally, the vast majority, 91.9% of participants, were nonsmokers, an important consideration when evaluating lifestyle-related risk factors.

Most prevalent comorbidity among the study participants was hypertension, affecting 29.3% of the sample. This finding is consistent with previous research, where hypertension was present in 53% of participants and those with elevated blood pressure had a 1.42-fold higher risk of developing AF compared to normotensive individuals [16]. Second most common comorbidity was DM, reported in 23.4% of the participants. The association between DM and AF is well-documented, with studies showing that individuals with diabetes have at least double the risk of developing AF compared to non-diabetics [17].

CKD was present in 6.6% of the study population. Several mechanisms may explain the relationship between CKD and increased AF risk. Renal impairment often leads to hypertension,[18] which can contribute to left ventricular hypertrophy, impaired ventricular compliance and subsequent atrial stretch and fibrosis key contributors to AF development [19,20]. In addition, CKD activates the intra-renal renin-angiotensin-aldosterone system, promoting cardiac hypertrophy and fibroblast proliferation, [21]which further support atrial structural and electrical remodeling [22]. Moreover, CKD increases the likelihood of developing cardiac conditions such as heart failure and coronary artery disease, both of which can induce to AF [19,23,24]. Asthma 3.6%, sleep apnea 2.3% and COPD 1.8% had lower prevalence rates in the study population than those of hypertension and diabetes. These findings suggest that, although these respiratory conditions were present, they were less common among older participants in this study, which contrasts the results of a study that found a high prevalence of COPD in patients with AF [25]. Further investigations are required to understand the contributing factors.

The history of cardiac disease among the study participants reflects the cardiovascular health of this older population. Heart failure was the most prevalent condition 34.9%, emphasizing its significance as a common cardiac condition in this demographic group. According to the Framingham study, men and women with chronic heart failure had an increased risk of AF by 4·5 and 5·9 fold, respectively [26]. Ischemic heart disease emerged as the second most prevalent cardiac condition, affecting a substantial 34.3% of the participants. Prior studies shown that AF occurred in 6–28% of patients with an early stage of Acute Myocadiac Ischemia [27–29]. Further investigations are required to identify and categorize these conditions for a more comprehensive understanding.

Regarding non-cardiac diseases, pneumonia was the most prevalent non-cardiac disease in our sample 12.9%. This finding aligns with that of Vitolo *et al.* [30] who emphasized pneumonia as a common respiratory condition in older individuals with AF [30]. A history of pulmonary embolism was reported by 3.8% of the participants, several studies in selected hospital-based cohorts have found an increased incidence of AF in acute PE patients compared to the general population [31–33]. Pulmonary hypertension was relatively rare 0.9%. This reflects the complex and less frequent nature of this condition among older adults; however, AF has a clinical impact on patients with pulmonary hypertension [34]. Further investigation may be necessary to categorize and understand these conditions in greater detail as they encompass a wide spectrum of health issues.

The limitation of our study is that it was a retrospective, single-center study with a relatively small sample size. Moreover, multicenter studies with larger sample sizes should be conducted to determine the scope of this problem and reduce the incidence of AF.

CONCLUSIONS

This study aimed to identify key risk factors for AF in older adults within tertiary hospital. The findings demonstrate that modifiable risk factors such as hypertension, diabetes mellitus, ischemic heart disease and heart failure play a significant role in the onset of AF beyond the effect of aging alone. To reduce the burden of AF, targeted public health interventions should include structured hypertension and diabetes management programs, along with national awareness campaigns focused on smoking cessation and maintaining a healthy weight. Additionally, strengthening primary care practices by enhancing physician training in early AF detection may lead to improved patient outcomes. These strategies are essential for reducing AF-related morbidity and mortality in Saudi Arabia's aging population.

REFERENCES

[1] Kim, Michael H. *et al.* "Estimation of total incremental health care costs in patients with atrial fibrillation in the United States." *Circulation: Cardiovascular Quality and Outcomes*, vol. 4, no. 3, May 2011, pp. 313–320. https://doi.org/10.1161/CIRCOUTCOMES.110.958165.

[2] Colilla, Susan *et al.* "Estimates of current and future incidence and prevalence of atrial fibrillation in the U.S. adult population." *The American Journal of Cardiology*, 2013. https://www.sciencedirect.com/science/article/pii/S0002914913012885. Accessed: 15 August 2025.

[3] Lowres, Nicole *et al.* "Screening to identify unknown atrial fibrillation." *Thrombosis and Haemostasis*, vol. 110, no. 2, 2013, pp. 213–222. https://doi.org/10.1160/TH13-02-0165.

[4] Hersi, Ahmad *et al.* "Saudi Atrial Fibrillation Survey: national, observational, cross-sectional survey evaluating atrial fibrillation management and the cardiovascular risk profile of patients." *Angiology*, vol. 66, no. 3, Mar. 2015, pp. 244–248. https://doi.org/10.1177/0003319714529180.

[5] Bapat, Ameya *et al.* "Relation of physical activity and incident atrial fibrillation (from the Multi-Ethnic Study of Atherosclerosis)." *The American Journal of Cardiology*, 2015. https://www.sciencedirect.com/science/article/pii/S0002914915015271. Accessed: 15 August 2025.

[6] Sankaranarayanan, Rajiv *et al.* "Comparison of atrial fibrillation in the young versus that in the elderly: a review." *Cardiology Research and Practice*, vol. 1, no. 1, 2013, p. 16. https://doi.org/10.1155/2013/976976.

[7] Boriani, Giuseppe *et al.* "The epidemiological burden of atrial fibrillation: a challenge for clinicians and health care systems." *European Heart Journal*, 2006. https://academic.oup.com/eurheartj/article-abstract/27/8/893/438877. Accessed: 15 August 2025.

[8] Kannel, William B. *et al.* "Epidemiologic features of chronic atrial fibrillation: the Framingham study." *New England Journal of Medicine*, vol. 306, no. 17, Apr. 1982, pp. 1018–1022. https://doi.org/10.1056/NEJM198204293061703.

[9] Benjamin, Emelia J. *et al.* "Independent risk factors for atrial fibrillation in a population-based cohort: the Framingham Heart Study." *JAMA*, https://jamanetwork.com/journals/jama/article-abstract/367563. Accessed: 15 August 2025.

[10] Nalliah, C.J. *et al.* "The role of obesity in atrial fibrillation." *European Heart Journal*, 2016. https://academic.oup.com/eurheartj/article-abstract/37/20/1565/2570447. Accessed: 15 August 2025.

[11] Ohlmeier, Christian *et al.* "Incidence, prevalence and antithrombotic management of atrial fibrillation in elderly Germans." *Europace*, 2013. https://doi.org/10.1093/europace/eut048.

[12] Heeringa, J. *et al.* "Prevalence, incidence and lifetime risk of atrial fibrillation: the Rotterdam study." *European Heart Journal*, 2006. https://academic.oup.com/eurheartj/article-abstract/27/8/949/2887153. Accessed: 15 August 2025.

[13] Lloyd-Jones, Donald M. *et al.* "Lifetime risk for development of atrial fibrillation: the Framingham Heart Study." *Circulation*, vol. 110, no. 9, Aug. 2004, pp. 1042–1046. https://doi.org/10.1161/01.CIR.0000140263.20897.42.

[14] Kim, Yun Gi *et al.* "Non-genetic risk factors for atrial fibrillation are equally important in both young and old age: a nationwide population-based study." *European Journal of Preventive Cardiology*, 2021. https://doi.org/10.1177/2047487320915664.

[15] Jeong, J.H. "Prevalence of and risk factors for atrial fibrillation in Korean adults older than 40 years." *Journal of Korean Medical Science*, vol. 20, no. 1, 2005, pp. 26–30. https://doi.org/10.3346/JKMS.2005.20.1.26.

[16] Krahn, A.D. *et al.* "The natural history of atrial fibrillation: incidence, risk factors and prognosis in the Manitoba Follow-Up Study." *The American Journal of Medicine*, 1999. https://www.sciencedirect.com/science/article/pii/S0002934399803489. Accessed: 15 August 2025.

[17] Seyed Ahmadi, Shilan *et al.* "Risk of atrial fibrillation in persons with type 2 diabetes and the excess risk in relation to glycaemic control and renal function: a Swedish cohort study." *Cardiovascular Diabetology*, vol. 19, no. 1, Jan. 2020. https://doi.org/10.1186/S12933-019-0983-1.

[18] Parikh, Nisha I. *et al.* "Cardiovascular disease risk factors in chronic kidney disease: overall burden and rates of treatment and control." *Archives of Internal Medicine*, vol. 166, no. 17, Sept. 2006, pp. 1884–1891. https://doi.org/10.1001/ARCHINTE.166.17.1884.

[19] Sarnak, Mark J. *et al.* "Kidney disease as a risk factor for development of cardiovascular disease: a statement from the American Heart Association." *Circulation*, vol. 108, no. 17, Oct. 2003, pp. 2154–2169. https://doi.org/10.1161/01.CIR.0000095676.90936.80.

[20] Vaziri, Sonya M. *et al.* "Echocardiographic predictors of nonrheumatic atrial fibrillation: the Framingham Heart Study." *Circulation*, vol. 89, no. 2, 1994, pp. 724–730. https://doi.org/10.1161/01.CIR.89.2.724.

[21] Iravanian, S. *et al.* "The renin-angiotensin-aldosterone system (RAAS) and cardiac arrhythmias." *Heart Rhythm*, 2008. https://www.sciencedirect.com/science/article/pii/S1547527108002063. Accessed: 17 August 2025.

[22] Voroneanu, L. *et al.* "Atrial fibrillation in chronic kidney disease." *European Journal of Internal Medicine*, 2016. https://www.sciencedirect.com/science/article/pii/S0953620516300760. Accessed: 17 August 2025.

[23] Astor, B.C. *et al.* "Kidney function and anemia as risk factors for coronary heart disease and mortality: the ARIC Study." *American Heart Journal*, 2006. https://www.sciencedirect.com/science/article/pii/S0002870305003583. Accessed: 17 August 2025.

[24] Kottgen, A. *et al.* "Reduced kidney function as a risk factor for incident heart failure: the ARIC Study." *Journal of the American Society of Nephrology*, 2007. https://journals.lww.com/JASN/fulltext/2007/04000/Reduced_Kidney_Function_as_a_Risk_Factor_for.33.aspx. Accessed: 17 August 2025.

[25] Simons, Sami O. *et al.* "Chronic obstructive pulmonary disease and atrial fibrillation: an interdisciplinary perspective." *European Heart Journal*, 2021. https://doi.org/10.1093/eurheartj/ehaa822.

[26] Kannel, W.B. *et al.* "Prevalence, incidence, prognosis and predisposing conditions for atrial fibrillation: population-based estimates." *The American Journal of Cardiology*, 1998. https://www.sciencedirect.com/science/article/pii/S0002914998005839. Accessed: 17 August 2025.

[27] Schmitt, J. *et al.* "Atrial fibrillation in acute myocardial infarction: a systematic review of the incidence, clinical features and prognostic implications." *European Heart Journal*, 2009. https://academic.oup.com/eurheartj/article-abstract/30/9/1038/478478. Accessed: 17 August 2025.

[28] Askari, A.T. *et al.* "The association between early ventricular arrhythmias, renin-angiotensin-aldosterone system antagonism and mortality in patients with ST-segment-elevation myocardial infarction." *American Heart Journal*, 2009. https://www.sciencedirect.com/science/article/pii/S0002870309003871. Accessed: 17 August 2025.

[29] Bloch Thomsen, Poul Erik *et al.* "Long-term recording of cardiac arrhythmias with an implantable cardiac monitor in patients with reduced ejection fraction after acute myocardial infarction: the Cardiac Arrhythmia and Risk Stratification After Acute Myocardial Infarction (CARISMA) study." *Circulation*, vol. 122, no. 13, Sept. 2010, pp. 1258–1264. https://doi.org/10.1161/CIRCULATIONAHA.109.902148.

[30] Vitolo, Marco *et al.* "Atrial fibrillation in pneumonia: what clinical implications at long-term?" *Internal and Emergency Medicine*, vol. 18, no. 2, Mar. 2023, pp. 347–350. https://doi.org/10.1007/S11739-022-03181-9.

[31] Koracevic, G.P. "Is atrial fibrillation a prognosticator in acute pulmonary thromboembolism?" *Medical Principles & Practice*, 2010. https://search.ebscohost.com/login.aspx?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=10117571&asa=N&AN=47899892. Accessed: 17 August 2025.

[32] Barra, S.N.C. *et al.* "Atrial fibrillation in acute pulmonary embolism: prognostic considerations." *Emergency Medicine Journal*, 2014. https://emj.bmj.com/content/31/4/308.short. Accessed: 17 August 2025.

[33] Kukla, Piotr *et al.* "Electrocardiography and prognosis of patients with acute pulmonary embolism." *Cardiology Journal*, vol. 18, no. 6, 2011, pp. 648–653. https://doi.org/10.5603/CJ.2011.0028.

[34] Rottlaender, Dennis *et al.* "Clinical impact of atrial fibrillation in patients with pulmonary hypertension." *PLOS One*, vol. 7, no. 3, March 2012. https://doi.org/10.1371/JOURNAL.PONE.0033902.